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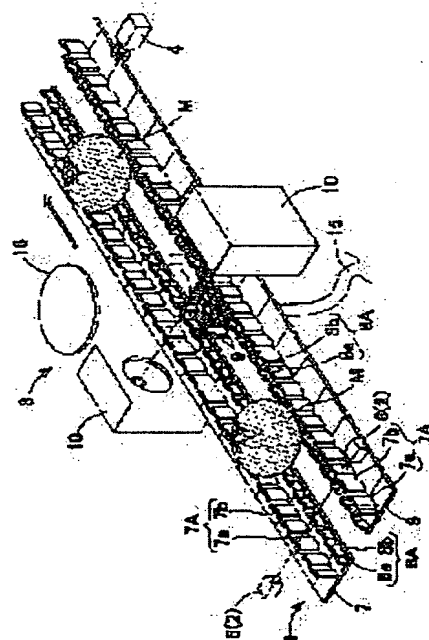
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(54) APPARATUS FOR MEASURING INTERNAL QUALITY OF VEGETABLES AND FRUITS

(57)Abstract:

PROBLEM TO BE SOLVED: To accurately and efficiently measure the internal quality of vegetables and fruits while simplifying constitution.

SOLUTION: An apparatus measures the internal quality of vegetables and fruits M by irradiating fed vegetables and fruits M with measuring light from an irradiation means 10, and detects the light transmitted through the vegetables and fruits M by a light detection means 11. The diffused region light from the irradiation means 10 is reflected by a reflecting means 16 to be incident on the light detection means 11 to obtain reference light.



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CLAIMS

[Claim(s)]

[Claim 1] The location which countered the light sensing portion of a light-receiving means on the basis of the measuring point of the garden stuff used as a device under test is equipped with a reflective means. The exposure means for irradiating a measuring beam from the direction which intersects perpendicularly with the light-receiving shaft of said light sensing portion mostly is arranged. The conveyance means equipped with the protection-from-light means for preventing that convey garden stuff to said measuring point, and the measuring beam from said measurement means carries out incidence to said light sensing portion is established. Read the measuring beam which a condensing field light from said exposure means was irradiated by garden stuff, and penetrated in said light sensing portion in the location which intersects perpendicularly mostly to the exposure shaft of this exposure means, perform internal quality measurement, and garden stuff in the condition of not being located in said measuring point And the internal quality measuring device of the garden stuff characterized by reading as a RIFARENSU light by reflecting the diffusion field light of said exposure means with said reflective means by the condition of being outside the field where the reflected light from the adjoining garden stuff etc. is not influenced, and carrying out incidence to said light sensing portion.

[Claim 2] The internal quality measuring device of the garden stuff according to claim 1 which comes to prepare the means which carries out modification accommodation of the quantity of light of the reflected light incorporated from said reflective means to said light sensing portion.

[Claim 3] said exposure means is irradiated from the conveyance cross direction of said conveyance means to garden stuff -- as -- arranging -- conveyance ***** of said conveyance means -- the internal quality measuring device of the garden stuff according to claim 1 which arranges said light-receiving means so that the measuring beam which has carried out incidence from the clearance between formation to pars intermedia to the lower part mostly may be received, and comes to arrange said reflective means to the method of right above of said light-receiving means.

[Claim 4] The internal quality measuring device of the garden stuff according to claim 1 or 3 which it comes to constitute the vertical height of said exposure means against garden stuff, enabling modification accommodation free [modification accommodation of the exposure sense of said exposure means against garden stuff], or free.

[Claim 5] The internal quality measuring device of the garden stuff according to claim 3 which comes to prepare the protection-from-light means for restricting the exposure width of face in the conveyance direction of the diffusion field light of said exposure means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] In what judges internal quality, such as a sugar content of garden stuff, such as an Amanatsu orange, a mandarin orange, 8 **, a persimmon, a nothing ** apple, or a melon, acidity, moisture content, and freshness, by nondestructive measurement, especially, about the internal quality measuring device and internal quality measuring method of useful garden stuff, this invention is highly precise and relates to the internal quality measuring device of the garden stuff which can judge quality at a high speed.

[0002]

[Description of the Prior Art] On horizontal direction 1 side face of the garden stuff by which installation conveyance is carried out on the band conveyor equipped with a flat belt, for example as an internal quality measuring device of the above-mentioned garden stuff A measuring beam (condensing field light) is irradiated from the single lamp (exposure means) arranged in the conveyance cross direction (longitudinal direction) 1 side of a band conveyor. As for said lamp, what performs internal quality measurement with the equipment of the light emitting/receiving linear model which receives the measuring beam which has penetrated said garden stuff with the light-receiving means arranged to the side besides the opposite side (longitudinal direction), i.e., the conveyance cross direction of a band conveyor, is common. And in order to obtain RIFARENSU (reference) light in said equipment, he is trying to receive light in the condition of not being saturated by attenuating the quantity of light of a condensing field light whose garden stuff is a strong light from a lamp (exposure means) in the condition of not being located in a measuring point by the change to an ND filter, or making a measuring point ***** (ing) and decreasing standard lives. However, it sets to what detects with a light-receiving means by which it was horizontal and the opposite location of the transmitted light was carried out, and measures a sugar content, acidity, etc. of garden stuff. What has the big size of garden stuff, the thing which has thick epidermis, what has the high consistency of pulp, etc., When attenuation of light is garden stuff which becomes large, un-arranging [for which the ratio of surroundings lump light, such as the reflected light reflected in the measurement front face of garden stuff, and the transmitted light becomes small, and surroundings / this / lump light causes / greatest / internal quality measuring accuracy degradation of garden stuff] occurs. Then, while increasing the quantity of light of the exposure light to garden stuff by arranging two or more lamps (exposure means) so that garden stuff may be surrounded in order to cancel above-mentioned un-arranging, many internal quality measuring devices constituted by the light emitting/receiving rectangular cross mold which made the direction of radiation of exposure light and the light-receiving direction of a light-receiving means intersect perpendicularly so that it can eliminate to said surroundings lump light are used. In said light emitting/receiving rectangular cross type of internal quality measuring device, in order to obtain RIFARENSU light, it is necessary to move standard lives to the conveyance path of fruit periodically. And in order to have to move standard lives to a high speed and predetermined timing, the configuration of the whole equipment becomes complicated, and there is not only un-arranging [which causes cost

quantity], but when said timing shifts by a certain cause, garden stuff will collide in a measurement housing. And generally, since inertial force is large, a transport device cannot be stopped in an instant, when said collision occurs. For this reason, since it led to the breakage accident of a device and the great damage was received, there was room of an improvement. Although it is cancelable un-arranging according to a gap of said timing by setting garden stuff and standard lives to a packet, keeping predetermined spacing incidentally, and using the continuation conveyor of the packet mold which can be conveyed since it is that through which the specific packet of the packets of a large number which insert garden stuff is resembled, standard lives are set, and it circulates Garden stuff cannot be set to the specific packet, but actuation of the operator who has set garden stuff artificially in simple cycling will be barred, and the decline in working capacity and aggravation of mental health are caused. Moreover, trouble generating of fruit tree liquid etc. tending to adhere to the packet which sets garden stuff, dust adhering to the adhering fruit tree liquid, the dust adhering to standard lives, and detection precision falling may be caused. Moreover, in the internal quality measuring device of a light emitting/receiving rectangular cross mold, although leading the exposure light from an exposure means to a light-receiving means with an optical fiber etc. is also considered, since it is that from which it not only needs a high precision, but an exposure means serves as an elevated temperature of a halogen lamp etc. in the optical coupling section, a fiber and an exposure means cannot be linked directly. Therefore, since the fiber light-receiving side is small, the measurement error by adhesion of dust etc. is large, in order to solve them, when it becomes expensive and constitutes from many halogen lamps especially, it becomes still more disadvantageous, and it is lacking in implementability. If it explains using the case where perform spectral analysis for said cause which becomes inconvenient, and internal quality is measured, the formula of the absorbance used as the base of spectral analysis When luminous intensity which penetrated $I_0(\lambda)$ and garden stuff for the luminous intensity from the light source which is an exposure means is made into $I_t(\lambda)$ and $k(\lambda) = c \cdot \epsilon$, an absorbance is $\log(I_0(\lambda)/I_t(\lambda)) = -d \cdot k(\lambda)$. -- It is expressed with a formula (3). However, it becomes a (molar absorption coefficient) and $\lambda =$ wavelength in the strength [$d =$ optical path length, $c =$ concentration, and $\epsilon =$ specification wavelength] of absorption. That is, if it asks for the absorbance itself, it becomes α , then $\alpha \cdot I_0(\lambda) =$ RIFARENSU light about the attenuation of RIFARENSU light, and a filter with the faithful optical path irradiated by garden stuff, and a required known attenuation and a flat wavelength property is needed. Considering this semantics, as a light which naturally carries out incidence to a light-receiving means as a RIFARENSU light, it must be a condensing field light. Therefore, the gap of the garden stuff conveyed in order to usually obtain concept top RIFARENSU light is sewn, an ND filter is changed, or standard lives are ***** (ed), and in a light emitting/receiving rectangular cross mold, in order that light may hardly go into a light sensing portion according to the protection-from-light effectiveness (operation) of a conveyance system, an ND filter cannot be used but the configuration for which a measuring point is made to ***** standard lives will be taken at a light emitting/receiving linear model. The light source and a condensing field light have obtained all as a RIFARENSU light according to the formula (3) which penetrated standard lives. The matter (thing of the quality of the material) with the suitable value and suitable attenuation in which the amplifier of a photo sensor and an electric system is not saturated with the configuration where it was [ceramic / Teflon (trademark),] suitable, as standard lives used with said light emitting/receiving rectangular cross mold, and a wavelength property is used.

[0003]

[Problem(s) to be Solved by the Invention] The place which this invention tends to solve in view of the above-mentioned situation is in the point which it is accurate and enables it to often measure the internal quality of garden stuff moreover, though simplification of a configuration is attained.

[0004]

[Means for Solving the Problem] The internal quality measuring device of the garden stuff of this invention is based on the measuring point of the garden stuff which turns into a device under test for the above-mentioned technical-problem solution. Equip with a reflective means the location which countered the light sensing portion of a light-receiving means, and the exposure means for irradiating a

measuring beam from the direction which intersects perpendicularly with the light-receiving shaft of said light sensing portion mostly is arranged. The conveyance means equipped with the protection-from-light means for preventing that convey garden stuff to said measuring point, and the measuring beam from said measurement means carries out incidence to said light sensing portion is established. Read the measuring beam which a condensing field light from said exposure means was irradiated by garden stuff, and penetrated in said light sensing portion in the location which intersects perpendicularly mostly to the exposure shaft of this exposure means, perform internal quality measurement, and garden stuff in the condition of not being located in said measuring point And it is characterized by reading as a RIFARENSU light by reflecting the diffusion field light of said exposure means with said reflective means by the condition of being outside the field where the reflected light from the adjoining garden stuff etc. is not influenced, and carrying out incidence to said light sensing portion. Also in of the same kind, the attenuation factor (permeability) by d , i.e., the optical path length, is large (about double figures), and garden stuff changes with the differences between magnitude, epidermis, a consistency, etc. the interior of garden stuff -- if the important point of measurement of description makes de - ke (λ) an effective absorbance -- the interior, such as a sugar content and acidity, -- it is in the place which cancels the effective optical path length de who is unrelated to description (internal quality). When the shape of interiority and correlation set to λ_0 wavelength which shows a low absorbance, it is de - $ke(\lambda)/de$ - $ke(\lambda_0)$.

de is eliminated by performing the becoming operation. Generally, first, the dark current data in the dark condition of system of measurement are deducted from device-under-test data and RIFARENSU data, by performing data processing, such as secondary differential, for what took the difference, offset, inclination, etc. are canceled, the difference of the wavelength which has correlation in a sugar content, acidity, etc. as a result, and its circumference wavelength is acquired, and the shape of interiority is computed by statistics processing by the multiple regression and the $P^{**}L^{**}S$ s grade etc. As the formula which expresses the shape of interiority in statistics processing a_1 , de - $ke(\lambda_1)+a_2$, and de - $ke(\lambda_2) - b - 1$, de - $ke(\lambda_{01})-b_2$, and the de - $ke(\lambda_{02}) - +c$ above λ_{01} and λ_{02} -- the interior -- the wavelength description and correlation indicate a high absorbance to be -- it is -- λ_{01} and λ_{02} -- the interior -- description and correlation are the wavelength which shows a low absorbance, and a_1 , b_1 , and c are the multipliers and constants for approximation. The effective optical path length de will be canceled by the term of λ_0 in approximation from the above-mentioned formula. From the above thing, RIFARENSU light does not need to be absolute and it means that you may be a constant. If the point which change of the wavelength property accompanying optical aging by the dust adhering to degradation of the light source and the light-receiving side of a light-receiving means etc. produces actually is solved, internal quality can be measured with a sufficient precision. Therefore, by making little (it being a taper) diffusion field light of the quantity of light which is not saturated the configuration which receives light with a light-receiving means By reflecting the diffusion field light which degradation of an exposure means etc. is reflecting with a reflective means, and making a light-receiving means it not only being able to to make unnecessary the standard lives which are needed in a light emitting/receiving rectangular cross mold, but reach The RIFARENSU light reflecting dirt, such as a light-receiving side of a light-receiving means, etc. can be obtained. And surroundings lump light, such as the reflected light reflected on the surface of garden stuff, does not reach a light sensing portion by reading the measuring beam which penetrated garden stuff in a light sensing portion from the direction which intersects perpendicularly with an exposure means mostly.

[0005] By establishing the means which carries out modification accommodation of the quantity of light of the reflected light incorporated from said reflective means to said light sensing portion, the quantity of light of the diffusion field light to the light-receiving means reflected with the reflective means according to the exposure quantity of light from an exposure means in the time of initial installation of an exposure means and exchange etc. can be quickly adjusted in the optimal amount.

[0006] It arranges so that said exposure means may be irradiated from the conveyance cross direction of said conveyance means to garden stuff. conveyance ***** of said conveyance means -- by arranging said light-receiving means so that the measuring beam which has carried out incidence from the

clearance between formation to pars intermedia to the lower part mostly may be received, and arranging said reflective means to the method of right above of said light-receiving means A conveyance means not only can perform protection from light to the exposure light from an exposure means, but it can arrange a reflective means using upper large space.

[0007] By constituting the vertical height of said exposure means against garden stuff, enabling modification accommodation free [modification accommodation of the exposure sense of said exposure means against garden stuff], or free, the direction of radiation or exposure height can be made into the optimal direction or the optimal height according to the magnitude of garden stuff.

[0008] By establishing the protection-from-light means for restricting the exposure width of face in the conveyance direction of the diffusion field light of said exposure means, spacing (spacing for obtaining RIFARENSU light) of the garden stuff which adjoin in the conveyance direction can be narrowed.

[0009]

[Embodiment of the Invention] The internal quality (interior description) measuring device of the garden stuff of this invention is shown in drawing 1 and drawing 2 . This measuring device is equipped with the band conveyor 1 as a conveyance means to convey the garden stuff M as a device under test, the photovoltaics 2 for detecting the existence of the garden stuff M conveyed on this band conveyor 1, the test section 3 of the light emitting/receiving rectangular cross mold for measuring the internal quality of the garden stuff M which passed these photovoltaics 2, and the rotary encoder 4 for computing the bearer rate of said band conveyor 1 etc. The concrete configuration of the internal quality measuring device of said garden stuff is not limited to what is shown in drawing, and can be changed freely.

[0010] The floodlighting section 5 by which said photovoltaics 2 have been arranged at the 1 side of the right-and-left both sides of said band conveyor 1, The direction which intersects perpendicularly with the conveyance direction of a band conveyor 1 from this floodlighting section 5 (the direction which intersects perpendicularly mostly is sufficient), That is, it consists of a light sensing portion 6 which accepts the light irradiated crosswise [conveyance]. The data in which binarization was carried out by the existence of the garden stuff on the optical-axis line of the floodlighting section 5 are outputted. It enables it to measure the gap of the garden stuff which adjoins each other in the location of garden stuff, size (magnitude), and the conveyance direction from the pulse number of said rotary encoder 4 which synchronized with conveyance of this data and said band conveyor 1.

[0011] the belts 7 and 8 of the shape of endless [of a Uichi Hidari pair] by which drive rotation of said band conveyor 1 is carried out with power, such as an electric motor, and these belts 7 and 8 -- while setting up on each top face and carrying out installation support of the garden stuff, it constitutes from plates 7A and 8A of right-and-left 2 train of the gobo combination for shading the exposure light from the below-mentioned exposure means 10. The same dimension is sufficient although plate 7A located in the conveyance cross direction outside of said plates 7A and 8A has set up the vertical (length) dimension for a long time rather than plate 8A located in the conveyance cross direction inside. Moreover, said plate 7A or 8A is ***** which tabular piece 7a or 8a located in a conveyance cross direction outside, tabular piece 7b located in the conveyance cross direction inside, or 8b is located by turns along the conveyance direction, and is constituted. Moreover, as the quality of the material of said tabular pieces 7a, 7b, 8a, and 8b, installation conveyance can be carried out by constituting each from synthetic resin, rubber, etc., such as urethane, without damaging garden stuff. Moreover, plate 8A located in the conveyance cross direction inside among said plates 7A and 8A is prepared with the inclination posture in which an upper limit side is located in a conveyance cross direction outside, and it enables it to make it contact, without a clearance occurring between the external surface of garden stuff, and the upper limit of plate 8A. By a diagram, although the plates 7B and 8B of two trains are formed in the belt of one sheet, the plate of one train (the thing of one sheet may be used) may be prepared, and the plate of three or more (the thing of three or more sheets may be used) trains can also be prepared and carried out. Moreover, a packet etc. may be prepared and carried out instead of a plate and these garden stuff may consist of only flat belts without what carries out installation support. Moreover, it enables it to arrange the belt 7 of said pair, and the light-receiving means 11 of the after-mentioned [just under / the clearance S formed by keeping predetermined spacing and putting eight comrades side by side].

And although it enables it to intercept the scattered reflection light which enters from said clearance S to the light sensing portion of the light-receiving means 11, without barring conveyance of garden stuff by arranging the protection-from-light brushes 9 and 9 on belt conveyance direction both sides of this light-receiving means 11, you may change into other configurations, such as an advantageous packet mold of the protection-from-light effectiveness used, for example, fixing to a transport device.

[0012] The exposure means 10 for said test section 3 to irradiate a measuring beam at garden stuff, as shown in drawing 1 - drawing 3, The light-receiving means 11 for receiving the measuring beam which has carried out incidence (migration) to said band conveyor 1 from the clearance S between formation to the lower part among the measuring beams irradiated and penetrated towards the garden stuff by which installation conveyance has been carried out to the exposure location on said band conveyor 1, the spectrum equipped with the spectroscope for distributing the measuring beam which received light with said light-receiving means 11 on component wavelength, and determining a spectrum, as shown in drawing 4 -- with equipment 12 It constitutes from a quality judging means 13 to carry out data processing based on the result from optical equipment 12 at this rate, and to judge quality, such as a sugar content, acidity, moisture content, and freshness, and a decision-output means 14 to output the judgment result from this quality judging means 13. the transmitted light and the below-mentioned RIFARENSU light which 15 shown in drawing 1 received with the light-receiving means 11 -- said spectrum -- it is an optical fiber for leading to equipment 12. Here, by arranging the light-receiving means 11 under the band conveyor 1 Although there is an advantage which can be held in the condition of it not only can carrying out the combination configuration of the protection from light to the surroundings lump light from the exposure means 10 etc. on a band conveyor 1, but having always made light-receiving distance from garden stuff into fixed distance mostly compared with the case where it has arranged to the upper part The light-receiving means 11 can also be arranged and carried out above a band conveyor 1. Since it is arranged just under the conveyance path of the garden stuff conveyed, and the fruit juice of the garden stuff which rotted in the light-receiving side of the light-receiving means 11, or the destroyed garden stuff etc. may fall and dust etc. may adhere to it, said light-receiving means 11 can make time and effort of cleaning unnecessary by establishing and carrying out automatic cleaning means, such as wiping off a light-receiving side periodically.

[0013] As are shown in drawing 2 and drawing 3, and it becomes with the projector which consists of a halogen lamp of the reflecting mirror mold of a Uichi Hidari pair arranged on conveyance cross direction both sides of a band conveyor 1 etc. and is shown in drawing 3 and drawing 5, said exposure means 10 irradiates condensing field light 10A from right-and-left both sides at garden stuff, and it is constituted so that the light which penetrated garden stuff may be received with said light-receiving means 11. For [three or more] one piece, two pieces, or illuminance reservation, a majority of said exposure means 10 may be established, and may be carried out. In addition, in establishing a majority of said exposure means 10, while a condensing field light which penetrated garden stuff is receivable for the light-receiving means 11, the below-mentioned reflective means 16 can receive diffusion field light, and it will arrange in the condition of surrounding focusing on the light-receiving means 11 or the reflective means 16 so that conveyance of garden stuff moreover may not be barred. Moreover, it is desirable by constituting the vertical height of said exposure means 10 against garden stuff, enabling modification accommodation free [modification accommodation of the exposure sense of said exposure means 10 against garden stuff], or free to make the direction of radiation or exposure height into the optimal direction or the optimal height according to the magnitude of garden stuff. Said modification accommodation can be performed using manual operation or electromotive force. When using said electromotive force, you may constitute and carry out so that the direction of radiation or exposure height may be automatically changed according to the magnitude (height) of garden stuff. Moreover, as shown in drawing 2 and drawing 3, the gobo 17 as a protection-from-light means for restricting the illuminating angle H of the diffusion field light of this exposure means 10 to each of conveyance direction both sides of said exposure means 10 is provided. thus, there is an advantage which can narrow spacing of the garden stuff M which adjoins each other in the conveyance direction, and Ms by forming gobos 17 and 17. In addition, if RIFARENSU light is read after garden stuff M has existed in said

illuminating angle H, since the reflected light reflected in the front face of garden stuff M will enter into the light-receiving means 11 through the direct or reflective means 16 and an error will occur in the accuracy of measurement, it is necessary to consider spacing of garden stuff M and M as garden stuff M not existing in the illuminating angle H. For this reason, reading of RIFARENSU light and the transmitted light of garden stuff M can be well read by narrowing down the illuminating angle H using gobos 17 and 17 as mentioned above. What can carry out modification accommodation of the include angle besides fixed, and the thing constituted free [slide migration] so that the garden stuff side tip location of gobos 17 and 17 could be changed may be used for said gobos 17 and 17. In addition, include-angle modification and the configuration which carries out slide migration of said gobos 17 and 17 will be performed using the manual force or electromotive force.

[0014] The reflective means 16 for making the upper part part as for which said light-receiving means 11 carries out an opposite location carry out incidence of the diffuse reflection light 16A to this light-receiving means 11 in response to diffusion field light 10B from said exposure means 10 is established. It is desirable to have the height control device (not shown) whose height control is possible while the garden stuff of an overall diameter sets said reflective means 16 as the height which can be passed enough. By carrying out height control of said height control device using the manual force or electromotive force, the level control of the quantity of light reflected in the time of initial installation of the exposure means 10 and exchange of the exposure means 10 etc. can be performed quickly. Although the means which carries out modification accommodation of the quantity of light of the reflected light incorporated by carrying out height control of said reflective means 16 to the light sensing portion of the reflective means 16 to the light-receiving means 11 can be constituted, you may be the configuration of changing the reflector product of the reflective means 16. The reflective means 16 shown in drawing is installing the lusterless disk of the white of the Teflon whose diameter is 60mm in a location with a height of 180mm from the conveyor front face of a band conveyor 1. In the condition of having been set as the above-mentioned height, if the quantity of light of the garden stuff, from which sufficient illuminance is obtained is set to 10-5, as for RIFARENSU light, the about ten to three strong quantity of light will be obtained. Opalescent glass (opal glass), a magnesium oxide spreading plate, a barium-sulfate spreading plate, etc. can be used as an ingredient near the ideal diffusing surface as a reflector of said reflective means 16, and also surface treatment which condenses the diffusion field light from the exposure means 10 to the light-receiving means 11 can be performed, or it can also constitute and carry out for the reflective means 16 which is not influenced by disturbance light and which carried out the required configuration where the device was balanced. Since the reflector of said reflective means 16 is in the condition which turned to the lower part, there is little effect of the dirt of a reflector and periodical cleaning is enough as it. In using said reflected light as a RIFARENSU light, degradation of the light source of extent, dirt of optical system, etc. which affect measurement precision have the advantage which can perform the transition monitor of wavelength property fluctuation and can be known beforehand by checking the wavelength data of RIFARENSU light for every clearance between the garden stuff conveyed.

[0015] If the case where internal quality measurement of garden stuff is performed using the internal quality measuring device of the garden stuff of said configuration is explained, by the garden stuff automatic feeder which is not illustrated to the conveyance start edge side of a band conveyor 1, garden stuff will be artificially supplied by automatic or the help, and garden stuff will be conveyed continuously. And the conveyed garden stuff is detected by photovoltaics 2, and garden stuff measures the distance of the garden stuff which approaches the measurement list of the timing and size which reach the light-receiving means 11 before and behind the conveyance direction. Garden stuff reaches a test section 3, if it is made the reading optimal region which does not have the surroundings lump light of garden stuff in the light-receiving means 11, the transmitted light will be received with the light-receiving means 11, and internal quality will be measured. The device under test (garden stuff) which diffusion field light adjoins in measurement of RIFARENSU light irradiates, the scattered reflection light reaches the reflective means 16, and the field which affects measurement exists. It is the time amount which has kept the distance of the line top of the field which does this effect for photovoltaics 2

from on the optical-axis line of that with this equipment from the place of 100mm (location of the light-receiving means 11 to 200mm) and to which this is made as for reading of RIFARENSU light, and has been a maximum of 100 seconds in the bearer rate which is per minute 60m. Since the illuminance obtained from the reflector of said reflective means 16 is large compared with the transmitted light of garden stuff, RIFARENSU light can be read also by the short time amount of 10 mses. moreover -- here -- a spectrum -- the equipment which can be adjusted to the optimal wavelength property amplitude also in a gain setup of the amplifier of equipment 12 is used. The garden stuff continuously conveyed to the conveyance trailer on said band conveyor 1 will be sorted out automatically or artificially using other selectors based on said measured value.

[0016]

[Effect of the Invention] By making it the configuration in which reflect the diffusion field light which degradation of an exposure means etc. is reflecting with a reflective means and which a light-receiving means is made to reach as a RIFARENSU light according to claim 1 Since the required standard lives etc. can be made unnecessary in a light emitting/receiving rectangular cross mold, while being able to attain simplification of a configuration The internal quality measuring device of the garden stuff which cannot break and can, quick moreover, measure internal quality, such as a sugar content of garden stuff, acidity, moisture content, and freshness, in a high precision can be offered. And by receiving the measuring beam which penetrated garden stuff from the direction which intersects perpendicularly with an exposure means mostly, surroundings lump light, such as the reflected light reflected on the surface of garden stuff, cannot reach a light-receiving means, and detection precision can be raised further.

[0017] The quantity of light of the diffusion field light to the light-receiving means reflected with the reflective means according to the exposure quantity of light from an exposure means in the time of initial installation of an exposure means and exchange etc. can adjust quickly in the optimal amount, and, according to claim 2, it becomes advantageous in a use side by establishing the means which carries out modification accommodation of the quantity of light of the reflected light incorporated from a reflective means to said light sensing portion.

[0018] According to claim 3, it arranges so that an exposure means may be irradiated from the conveyance cross direction of a conveyance means to garden stuff. conveyance ***** of a conveyance means -- by arranging a light-receiving means so that the measuring beam mostly carried out from the clearance between formation to pars intermedia to the lower part may be received, and arranging a reflective means to the method of right above of a light-receiving means It not only can attain simplification of the part configuration, but a conveyance means can perform protection from light to the exposure light from an exposure means, and it can arrange a reflective means exactly using upper large space.

[0019] According to claim 4, by constituting the vertical height of the exposure means against garden stuff, enabling modification accommodation free [modification accommodation of the exposure sense of the exposure means against garden stuff], or free, according to the magnitude of garden stuff, the direction of radiation or exposure height can be made into the optimal direction or the optimal height, garden stuff can be irradiated efficiently, and the accuracy of measurement can be raised irrespective of the magnitude of garden stuff.

[0020] According to claim 5, by establishing the protection-from-light means for restricting the exposure width of face in the conveyance direction of the diffusion field light of an exposure means, spacing (spacing for obtaining RIFARENSU light) of the garden stuff which adjoin in the conveyance direction can be narrowed, spacing of the garden stuff to convey can be narrowed and internal quality measurement of garden stuff can be well performed not to mention RIFARENSU light.

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TECHNICAL FIELD

[Field of the Invention] In what judges internal quality, such as a sugar content of garden stuff, such as an Amanatsu orange, a mandarin orange, 8 **, a persimmon, a nothing ** apple, or a melon, acidity, moisture content, and freshness, by nondestructive measurement, especially, about the internal quality measuring device and internal quality measuring method of useful garden stuff, this invention is highly precise and relates to the internal quality measuring device of the garden stuff which can judge quality at a high speed.

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PRIOR ART

[Description of the Prior Art] It is the single lamp arranged in horizontal direction 1 side face of the garden stuff by which installation conveyance is carried out on the band conveyor equipped with a flat belt, for example as an internal quality measuring device of the above-mentioned garden stuff at the conveyance cross direction (longitudinal direction) 1 side of a band conveyor.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] By making it the configuration in which reflect the diffusion field light which degradation of an exposure means etc. is reflecting with a reflective means and which a light-receiving means is made to reach as a RIFARENSU light according to claim 1 Since the required standard lives etc. can be made unnecessary in a light emitting/receiving rectangular cross mold, while being able to attain simplification of a configuration The internal quality measuring device of the garden stuff which cannot break and can, quick moreover, measure internal quality, such as a sugar content of garden stuff, acidity, moisture content, and freshness, in a high precision can be offered. And by receiving the measuring beam which penetrated garden stuff from the direction which intersects perpendicularly with an exposure means mostly, surroundings lump light, such as the reflected light reflected on the surface of garden stuff, cannot reach a light-receiving means, and detection precision can be raised further. [0017] The quantity of light of the diffusion field light to the light-receiving means reflected with the reflective means according to the exposure quantity of light from an exposure means in the time of initial installation of an exposure means and exchange etc. can adjust quickly in the optimal amount, and, according to claim 2, it becomes advantageous in a use side by establishing the means which carries out modification accommodation of the quantity of light of the reflected light incorporated from a reflective means to said light sensing portion.

[0018] According to claim 3, it arranges so that an exposure means may be irradiated from the conveyance cross direction of a conveyance means to garden stuff. conveyance ***** of a conveyance means -- by arranging a light-receiving means so that the measuring beam mostly carried out from the clearance between formation to pars intermedia to the lower part may be received, and arranging a reflective means to the method of right above of a light-receiving means It not only can attain simplification of the part configuration, but a conveyance means can perform protection from light to the exposure light from an exposure means, and it can arrange a reflective means exactly using upper large space.

[0019] According to claim 4, by constituting the vertical height of the exposure means against garden stuff, enabling modification accommodation free [modification accommodation of the exposure sense of the exposure means against garden stuff], or free, according to the magnitude of garden stuff, the direction of radiation or exposure height can be made into the optimal direction or the optimal height, garden stuff can be irradiated efficiently, and the accuracy of measurement can be raised irrespective of the magnitude of garden stuff.

[0020] According to claim 5, by establishing the protection-from-light means for restricting the exposure width of face in the conveyance direction of the diffusion field light of an exposure means, spacing (spacing for obtaining RIFARENSU light) of the garden stuff which adjoin in the conveyance direction can be narrowed, spacing of the garden stuff to convey can be narrowed and internal quality measurement of garden stuff can be well performed not to mention RIFARENSU light.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The place which this invention tends to solve in view of the above-mentioned situation is in the point which it is accurate and enables it to often measure the internal quality of garden stuff moreover, though simplification of a configuration is attained.

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MEANS

A measuring beam (condensing field light) is irradiated from a (exposure means), and, as for said lamp, what performs internal quality measurement with the equipment of the light emitting/receiving linear model which receives the measuring beam which has penetrated said garden stuff with the light-receiving means arranged to the side besides the opposite side (longitudinal direction), i.e., the conveyance cross direction of a band conveyor, is common. And in order to obtain RIFARENSU (reference) light in said equipment, garden stuff is in the condition of not being located in a measuring point, and it is a lamp.

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OPERATION

In order that light may hardly go into a light sensing portion according to (an operation), an ND filter cannot be used but the configuration made to ***** standard lives to a measuring point will be taken. The light source and a condensing field light have obtained all as a RIFARENSU light according to the formula (3) which penetrated standard lives. The matter (thing of the quality of the material) with the suitable value and suitable attenuation in which the amplifier of a photo sensor and an electric system is not saturated with the configuration where it was [ceramic / Teflon (trademark),] suitable, as standard lives used with said light emitting/receiving rectangular cross mold, and a wavelength property is used.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline perspective view of the internal quality measuring device of garden stuff.

[Drawing 2] It is the outline top view of the internal quality measuring device of garden stuff.

[Drawing 3] It is the vertical section rear view of a test section.

[Drawing 4] It is a block diagram for processing a measuring beam.

[Drawing 5] It is the explanatory view showing the field of the light of an exposure means.

[Description of Notations]

1 Band Conveyor (Conveyance Means)

2 Photovoltaics 3 Test Section

4 Rotary Encoder

5 Floodlighting Section 6 Light Sensing Portion

7 Eight Belt 7A, 8A Plate

7a, 7b, 8a, 8b Tabular piece

9 Protection-from-Light Brush 10 Exposure Means

10A Condensing field light 10B Diffusion field light

11 Light-receiving Means 12 Spectrum -- Equipment

13 Quality Judging Means 14 Decision-Output Means

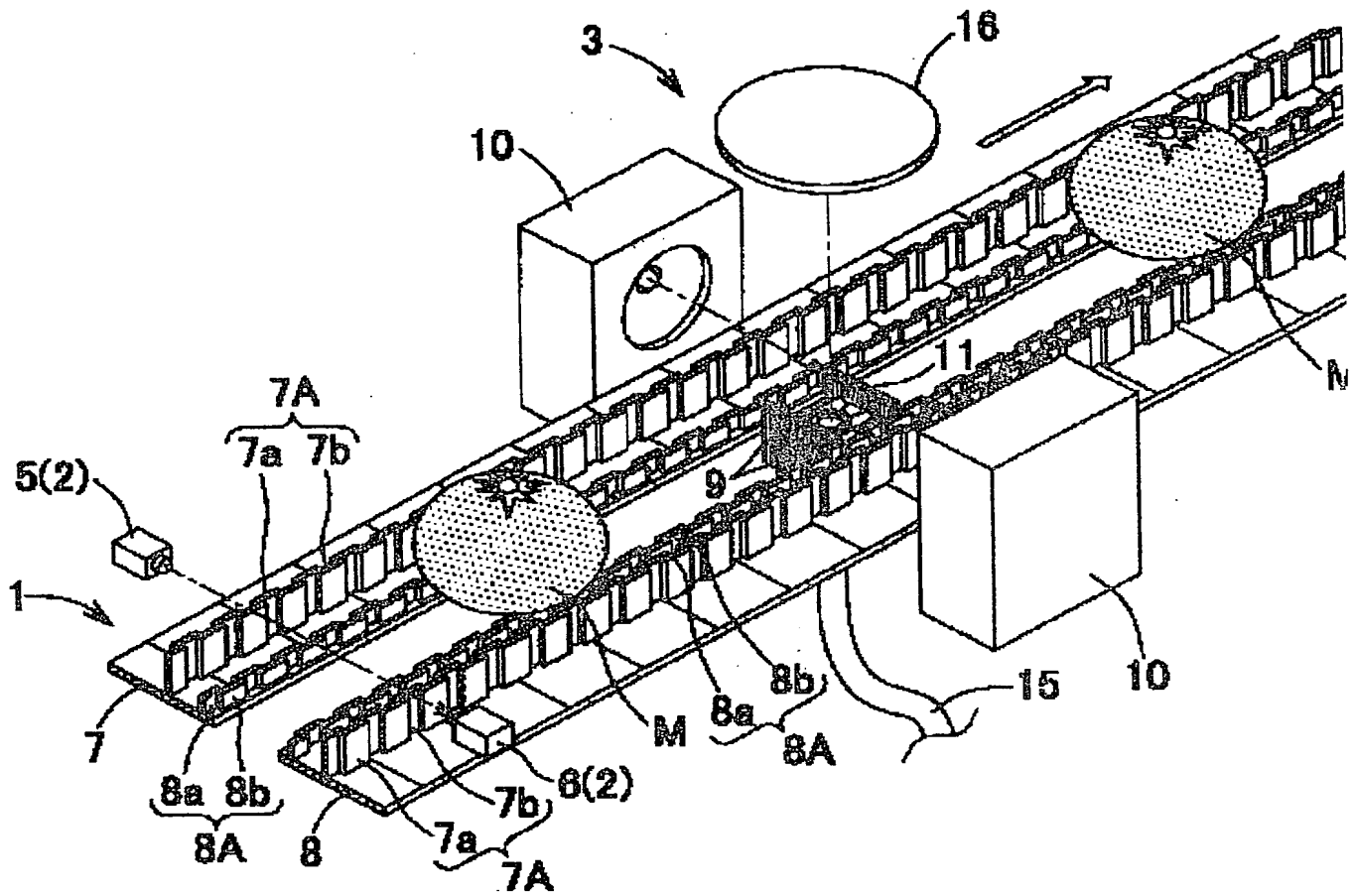
15 Optical Fiber

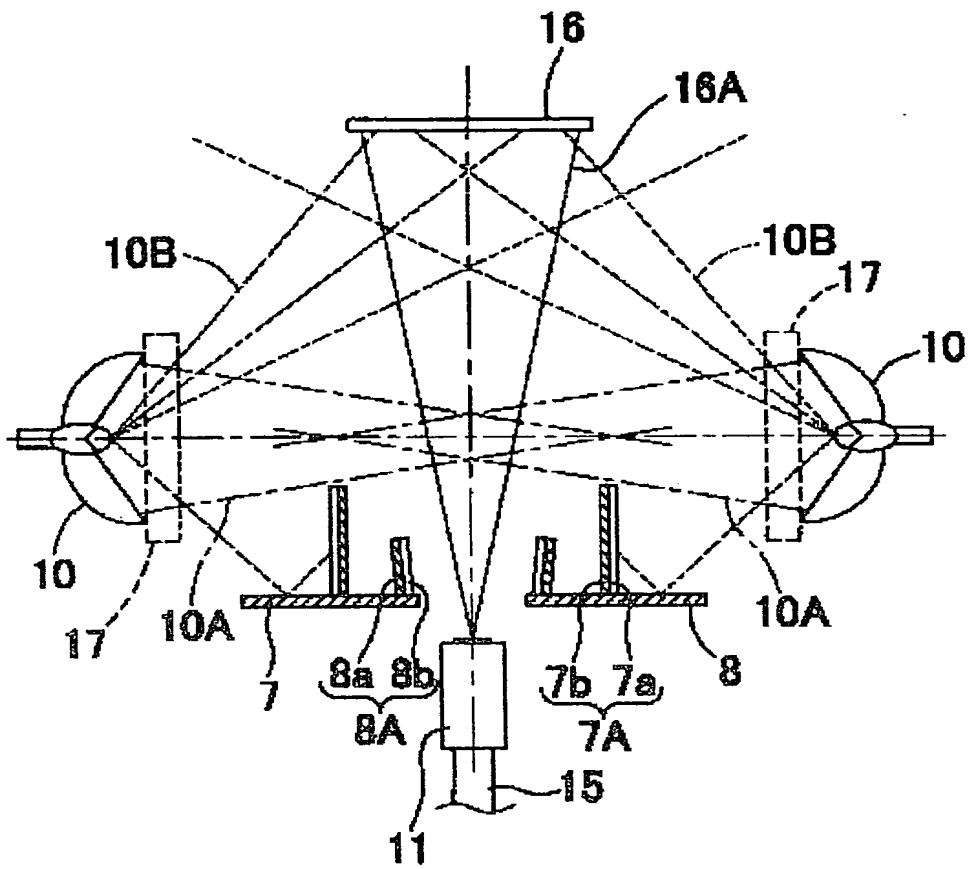
16 Reflective Means 16A Diffuse Reflection Light

17 Gobo H Illuminating Angle

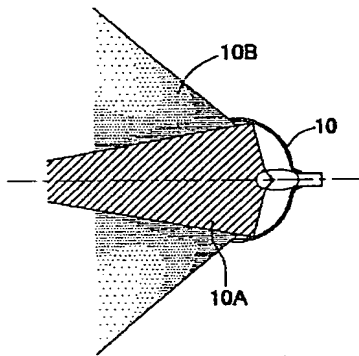
M Garden stuff

[Translation done.]



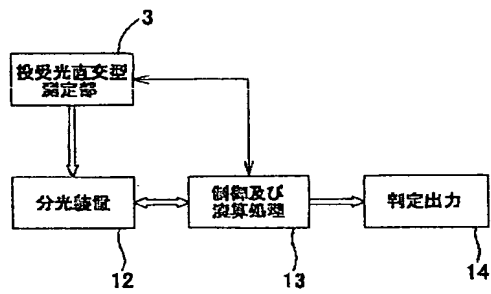


Drawing selection drawing 5



[Translation done.]

Drawing selection drawing 4



[Translation done.]